

Specification for

**Precision hexagon
bolts, screws and nuts
(B.S.W. & B.S.F.
threads)**

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Associated Offices' Technical Committee	Institution of Civil Engineers
Association of Consulting Engineers	Institution of Gas Engineers
Association of Mining Electrical and Mechanical Engineers	Institution of Heating & Ventilating Engineers
Board of Trade	Institution of Mechanical Engineers
British Chemical Plant Manufacturers' Association	Institution of Mechanical Engineers (Automobile Division)
British Compressed Air Society	Institution of Production Engineers*
British Electrical and Allied Manufacturers' Association*	Locomotive and Allied Manufacturers' Association of Great Britain*
British Gear Manufacturers' Association	London Transport Board
British Internal Combustion Engine Manufacturers' Association*	Machine Tool Trades Association*
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British Mechanical Engineering Federation*	Ministry of Defence, Navy Department*
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Electricity Council, The Generating Board and the Area Boards in England and Wales	Ministry of Public Building and Works
Engineering Equipment Users' Association*	Ministry of Technology — National Engineering Laboratory
Gas Council	Ministry of Transport
High Commission of India*	National Coal Board
Institute of Marine Engineers	National Physical Laboratory (Ministry of Technology)*
	Radio Industry Council
	Royal Institute of British Architects

The Government department and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Agricultural Engineers' Association	Electronic Engineering Association
Association of Hydraulic Equipment Manufacturers	Fasteners and Turned Parts Institute
Bright Bolt & Nut Manufacturers' Association	Heat Treated Bolt Association
Bright Steel Bar Association	Institute of Iron and Steel Wire Manufacturers
British Constructional Steelwork Association	Ministry of Aviation
British Cycle & Motor Cycle Industries Association Limited	Post Office
Council of British Manufacturers of Petroleum Equipment	Rolled Thread Screw Association
	Society of Motor Manufacturers & Traders, Ltd.
	Washer Manufacturers' Association

This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 20 August 1965

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First published 1942
First revision March 1951
Second revision August 1965

The following BSI references relate to the work on this standard:
Committee reference MEE/60
Draft for comment D64/4771

ISBN 0 580 35088 6

Amendments issued since publication

Amd. No.	Date	Comments

Amendment No. 1, published 11 August, 1966

to BS 1083:1965

Precision hexagon bolts, screws and nuts

At a fully representative conference held on 23rd November, 1965 consideration was given to the action to be taken in relation to the move to metric as far as British Standards for screw threads were concerned and it was decided that:

British industry should be strongly recommended to adopt the internationally agreed ISO metric threads¹⁾ or ISO inch threads²⁾ but that the ISO inch threads should be regarded as second choice. The implementation of this recommendation means that B.A., B.S.F. and B.S.W. threads should become obsolescent and should not be used in new designs.

ACCORDINGLY IT HAS BEEN AGREED THAT BS 1083 BE RENDERED OBSOLESCENT: IT WILL BE MADE OBSOLETE IN DUE COURSE.

NOTE The equivalent metric standard is BS 3692, "*Dimensions of ISO metric precision hexagon bolts, screws and nuts*".

¹⁾ BS 3643, "*ISO metric screw threads*".

²⁾ BS 1580, "*Unified screw threads*".

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Foreword

This standard makes reference to the following British Standards:

BS 84, *Parallel screw threads of Whitworth form.*

BS 131, *Methods for notched bar tests — Part 1: The Izod impact test on metals.*

BS 240, *Method for Brinell hardness test.*

BS 860, *Table of approximate comparison of hardness scales.*

BS 919, *Screw gauge limits and tolerances — Part 2: Gauges for screw threads other than those of Unified form.*

BS 969, *Plain limit gauges: Limits and tolerances.*

BS 1574, *Split cotter pins.*

This British Standard has been prepared under the authority of the Mechanical Engineering Standards Committee.

Since the last revision of BS 1083 was published in 1951, an ISO Recommendation has established an ISO inch (Unified) thread and an ISO metric thread as world standards for the future. Fasteners having the ISO inch thread are already being used in many fields and it may be expected that fasteners having the ISO metric thread will come increasingly into use. If this occurs, the extent of use of fasteners covered by BS 1083 will obviously diminish.

It is recognized that any change-over period will necessarily be longer in some industries than in others and as fasteners to BS 1083 are still widely used it is considered that the standard should be brought up to date as far as general requirements are concerned.

The principal changes in this revision are the deletion of the 2 B.A. fasteners and of tables for short and long bolts, some alterations in the thicknesses of bolt heads and lock-nuts to bring them into line with present-day practice and alignment of the provisions for features such as length tolerances, eccentricity of bolts and countersinking of nuts with those for Unified fasteners. No change has been made in the requirements for material.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard covers precision hexagon bolts, screws and nuts having B.S.W. or B.S.F. threads in a range of nominal sizes from $\frac{1}{4}$ in to 2 in inclusive. The dimensional requirements of this standard apply to both ferrous and non-ferrous bolts, screws and nuts. Mechanical properties are given only in respect of steel bolts, screws and nuts and the finishes in which they are normally supplied are described in Clause 3.

2 Material

The steel used for the manufacture of the bolts, screws and nuts shall be such that the finished products possess the mechanical properties appropriate to the particular class of bolts, screws and nuts ordered by purchaser, as designated by the grade letter and as set out in Table 4 and Table 5 of Appendix A.

If the bolts and screws are produced by cold forging they shall except in the case of precision bolts and screws bright finished to grade letter A (see Appendix A), be heat-treated after forging. Bolts, screws and nuts produced by hot-forging or turning from the bar shall be heat-treated when this is necessary to give the requisite mechanical properties.

3 Finish

- a) *General.* The bolts, screws and nuts shall be cleanly finished, sound and free from defects.
- b) *Types of finish.* Steel precision bolts, screws and nuts are normally supplied with the following finishes:
 - i) *Heat-treated bolts and screws.* The surfaces of these bolts and screws are customarily dull black from heat treatment, although the manufacturer may machine some of the surfaces of the larger bolts and screws after heat treatment.
 - ii) *Bright finished bolts and screws.* This term is used to describe bolts and screws which are machined on all surfaces or which have a finish on the hexagons produced by bright drawing and regarded as a machined finish.
 - iii) *Nuts.* These may be bright on all surfaces or dull black when heat treated.
 - iv) *Special finishes.* If steel bolts, screws or nuts are required bright all over, the purchaser should state this in his enquiry and order.

If the purchaser requires bolts, screws or nuts of steel or other material to be coated, he should state the type of coating required in his enquiry and order.

4 Dimensions

The bolts, screws and nuts shall conform to the dimensions and tolerances given in Table 1 to Table 3 inclusive, and Clauses 5 to 11 inclusive.

5 Length of bolts and screws

- a) The nominal length of a bolt or screw shall be the distance from the underside of the head to the extreme end of the shank including any chamfer or radius.

NOTE The nominal lengths of bolts and screws normally stocked are given in Appendix C.

b) The tolerance on the nominal length shall be as given below:

Nominal length	Diameter	Tolerance on length
in	in	in
Up to and including 1	Up to and including $\frac{3}{4}$	$+0 - \frac{1}{32}$
	Over $\frac{3}{4}$	$+0 - \frac{1}{16}$
Over 1 up to and including 2	Up to and including $\frac{3}{4}$	$+0 - \frac{1}{16}$
	Over $\frac{3}{4}$	$+0 - \frac{1}{8}$
Over 2 up to and including 6	Up to and including $\frac{3}{4}$	$+0 - \frac{3}{32}$
	Over $\frac{3}{4}$	$+0 - \frac{3}{16}$
Over 6	All diameters	$+0 - \frac{3}{16}$

6 Ends of bolts and screws

The ends of bolts and screws may, at the option of the manufacturer, be finished with either a flat chamfer with a 90° included angle to a depth slightly exceeding the depth of thread or a radius approximately equal to $1\frac{1}{4}$ times the nominal diameter of shank. When bolts and screws are made with rolled threads the lead formed at the end of the bolt or screw by the thread rolling operation may be regarded as providing the necessary chamfer to the end, no other machining operation being necessary, and the end shall be reasonably square with the centre line of the shank.

7 Screw threads

- a) *General*. The screw threads shall be B.S.W. or B.S.F. in accordance with BS 84, "Parallel screw threads of Whitworth form" as specified by the purchaser.
- b) *Bolts and screws*. The screw threads may be cut or rolled at the option of the manufacturer and shall conform to the limits and tolerances for medium class specified in BS 84.
- c) *Nuts*. The screw threads shall conform to the limits and tolerances for normal class specified in BS 84.
- d) *Gauging of screw threads*. Screw threads shall be gauged in accordance with the system recommended in BS 919, "Screw gauge limits and tolerances", Part 2, "Gauges for screw threads other than those of Unified form".

8 Length of thread

- a) *Bolts*. The length of thread on bolts shall be the distance from the end of the bolt (including any chamfer or radius) to the leading face of a screw ring gauge which has been screwed as far as possible on to the bolt by hand.

The minimum thread length shall be twice the diameter.

Bolts that are too short for minimum thread length shall be threaded as screws and shall be designated screws.

NOTE The shortest designated lengths for bolts are tabulated for guidance in Appendix C.

- b) *Screws*. Screws shall be so threaded that a screw ring gauge can be screwed by hand to within a distance from the underside of the head not exceeding two and a half times the pitch for diameters up to and including 1 in, and three and a half times the pitch for diameters over 1 in.

- c) *Tolerances*.

i) *Tolerance on bolt thread length*. The tolerance on thread length shall be plus $\frac{3}{16}$ in or $2\frac{1}{2}$ threads, whichever is the greater, for all lengths.

ii) *Tolerance on eccentricity*. Tolerance on eccentricity (including out of parallelism) of thread in relation to body for sizes up to and including $\frac{3}{4}$ in shall be 0.010 in for each inch of length when measured in a sleeve gauge. For sizes over $\frac{3}{4}$ in, total eccentricity shall be the subject of agreement between manufacturer and purchaser.

NOTE Details of the sleeve gauge referred to above are given in Appendix B.

9 Nuts — squareness of thread to face

The axis of the thread of the nut shall be square to the face of the nut subject to the “squareness tolerance” specified in Table 2, Column 11 and Table 3, Column 16.

The nut shall be screwed by hand on to a tapered truncated screw gauge until the thread of the nut is tight on the thread of the screw gauge. A sleeve, sliding on a parallel extension of the tapered screw gauge, and which has a face diameter equal to the minimum distance across flats of the nuts and exactly at 90° to the axis of the screw gauge, shall be brought into contact with the leading face of the nut. With the sleeve in this position it shall not be possible for a feeler gauge of thickness equal to the “squareness tolerance” to enter anywhere between the leading face of the nut and the face of the sleeve.

NOTE Details of the gauge referred to above are given in Appendix B.

10 Chamfering and washer-facing

a) *Bolts and screws.* Bolt and screw heads shall have a chamfer of approximately 30° on their upper faces, and, at the option of the manufacturer, a washer face or full bearing face on the underside.

b) *Nuts.*

i) Ordinary nuts and slotted nuts shall have a chamfer of approximately 30° on their upper faces and, at the option of the manufacturer, may, in addition, have a similar chamfer or a washer face on their lower faces.

ii) Lock-nuts shall have a chamfer of approximately 30° on both faces.

iii) Castle nuts shall have the sharp edge on their upper faces removed and, at the option of the manufacturer, may, in addition, have a chamfer of approximately 30° or a washer face on their lower faces. The hexagonal portion shall have a chamfer of approximately 30° at the point where it joins the castellated portion.

iv) All nuts shall be countersunk on the bearing face at an included angle of $120 \pm 10^\circ$: the diameter of the countersink shall not exceed the nominal major diameter of the thread (see Figure 10).

With the exception of slotted nuts and castle nuts, all hexagon nuts chamfered at both ends shall also have a countersink as above at both ends of the thread.

NOTE The option referred to in Subclauses a) and b) above shall apply unless the purchaser in his enquiry and order specifically states that he requires one of the alternatives available.

Attention is drawn to the fact that these alternative methods of finishing the underside of bolt and screw heads and the lower face of nuts are associated both with the nominal size and the particular method of manufacture. A request by the purchaser for a specific type of finish limits the manufacturing processes available and it is therefore recommended that the purchaser avoid making such a request unless circumstances fully justify it.

11 Split-pin holes and slots

Bolts with split-pin holes will be supplied only when specially ordered. The purchaser should state in his enquiry and order, dimension *J*. (See Table 1, Figure 1.)

A tolerance of $+ \frac{1}{32}$ in – 0 shall be permissible on the specified *J* (see Figure 1).

The maximum “off-centre” distance between the centre-line of the split-pin hole in bolts and the axis of the thread as given in Table 1, Column 18. This shall be checked by means of a screwed ring gauge with appropriate slot and a plain plug gauge which shall be a “GO” gauge in the minimum split-pin hole. (See Figure 19 in Appendix B.)

The maximum “off-centre” distance between the centre-line of the slots in slotted nuts and the axis of the tapped hole is given in Table 3, Column 15. This shall be checked by means of a screwed plug gauge with appropriate slot and a plain plug gauge which shall be a “GO” gauge in the minimum slot. (See Figure 20 in Appendix B.)

NOTE For full dimensional and other requirements of split cotter pins, reference should be made to BS 1574, “Split cotter pins”.